

CLAIMS

We claim:

- 1) An electronic article surveillance tag comprising:
 - a) a tag housing;
 - b) a tack consisting of a tack head and a tack shaft wherein said tack shaft is inserted through a portion of the article to be protected and into a first opening in said tag housing;
 - c) a releasable ball bearing clutching means within said tag housing for retaining a portion of said tack shaft within said tag body;
 - d) a second opening in said tag housing for insertion of a probe which operates to release said ball bearing clutching means; and
 - e) a sensor means contained within said housing.
- 2) The tag of claim 1 wherein said ball bearing clutching means comprises a set of three ball bearings retained within a spindle which generally retains the balls in a spaced relationship to each other, said spindle further incorporating a central aperture which is oriented directly beneath said first opening in said tag housing such that said tack shaft is inserted through the central aperture of said spindle.
- 3) The tag of claim 2 wherein said spindle is further characterized as featuring

- a) a hollow annular portion within which said three ball bearings are disposed and wherein said hollow portion further features three openings along the outer wall of said annular portion sized such that a portion of said ball bearings may protrude through said openings when said tack shaft is inserted into said central aperture of said spindle; and
 - b) three or more support legs which support said spindle while orienting said hollow annular portion axially with respect to said first opening in said housing.
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- 4) The tag of claim 3 wherein said hollow annular seat portion of said spindle is made of a material which is attractive to a magnet.
 - 5) The tag of claim 3 wherein one of said support legs features an engagement tab designed to be contacted by a probe inserted into said second opening in said tag housing such that contact of said engagement tab by said probe serves to rotate said spindle about a central axis.
 - 6) The tag of claim 3 wherein said clutching means is further comprised of a cup within which said spindle and ball bearings are placed and wherein said cup is tapered gradually from the top edge of the cup to the bottom of the cup.
 - 7) The tag of claim 6 wherein said tapered cup, spindle and ball bearings are sized such that when said tack shaft is fully inserted into said tag housing and through the central

aperture of said spindle, the tack shaft will be tightly wedged between the three ball bearings which are tightly held by the wall of said tapered cup such that said shaft is prevented from being removed from said tag housing.

- 8) The tag of claim 6 wherein said tag housing is further characterized in that said housing features a seat portion integral to said housing, and wherein said tapered cup is disposed in said seat portion.
- 9) The tag of claim 8 wherein said seat portion features a graduated lip portion around the circumference of said seat and wherein said engagement tab of said spindle may be caused to ride along the edge of said lip portion upon engagement of said tab by a probe inserted into said housing through said second opening, thereby turning said spindle and wherein said spindle is caused to raise from said tapered cup by the operation of said engagement tab traveling upon said lip portion as said tab is turned, and wherein the lifting of said spindle from said tapered cup enables said ball bearings to separate as a portion of each said ball bearing is allowed to protrude from the annular wall of said central spindle portion, and which accordingly enables said tack shaft to be released from the grip of said ball bearings for removal of said tack from said tag housing.
- 10) The tag of claim 9 wherein said tack shaft is released from said clutching means after said spindle has been rotated approximately one quarter turn.

- 11) The tag of claim 6 wherein a biasing means is disposed within said housing which urges said spindle into said cup.
- 12) The tag of claim 11 wherein said biasing means is a spring.
- 13) The tag of claim 1 wherein said tag housing is constructed of two pieces of hard plastic.
- 14) The tag of claim 6 wherein said cup is constructed of a metal.
- 15) The tag of claim 1 wherein said tack shaft features regions of varied diameter in order to assist said clutching means in maintaining a tight grip on said shaft during retention of said shaft in said housing.
- 16) The tag of claim 15 wherein said shaft features one or more regions wherein said shaft is flattened.
- 17) An electronic article surveillance tag comprising:
 - a) a tag housing;
 - b) a tack consisting of a tack head and a tack shaft wherein said tack shaft is inserted through a portion of the article to be protected and into a first opening in said tag housing;
 - c) a releasable ball bearing clutching means within said tag housing for retaining a portion of said tack shaft within said tag body;

- d) a biasing means for effecting the operation of said releasable ball bearing clutching means; and
 - e) a sensor means contained within said housing.
- 18) The tag of claim 18 wherein said biasing means is a spring.
- 19) The tag of claim 18 wherein a magnetic detacher may be used to compress said spring to operate said ball bearing clutching means, thereby releasing said tack shaft for removal from said tag.
- 20) An electronic article surveillance tag comprising:
- a) a tag housing;
 - b) a tack consisting of a tack head and a tack shaft wherein said tack shaft is inserted through a portion of the article to be protected and into a first opening in said tag housing;
 - c) a releasable ball bearing clutching means within said tag housing for retaining a portion of said tack shaft within said tag body;
 - d) a second opening in said tag housing for insertion of a probe which operates to release said ball bearing clutching means;
 - e) a biasing means for effecting the operation of said releasable ball bearing clutching means; and
 - f) a sensor means contained within said housing.

- 21) An electronic article surveillance tag of claim 20 wherein the release of said tack shaft from said tag may be accomplished by compressing said biasing means by either a magnetic detacher or by insertion of a probe into said second opening in said housing.
- 22) An electronic article surveillance system comprising:
- a) a tag housing;
 - b) a tack consisting of a tack head and a tack shaft that is inserted through a portion of the article to be protected and into a first opening in said tag housing;
 - c) a releasable ball bearing clutching means for retaining said tack shaft, said means comprising a set of three ball bearings retained within a spindle which generally retains the balls in a spaced relationship to each other, said spindle further incorporating a central aperture which is oriented directly beneath said opening in said tag housing such that said tack shaft is inserted through the central aperture of said spindle;
 - d) a second opening in said tag housing for insertion of a probe which operates to release said ball bearing clutching means;
 - e) a sensor means contained within said housing which functions to transmit a signal upon the entry of the protected article into a pre-defined surveillance zone; and
 - f) a means for receiving said signal to detect the presence of the protected article in the surveillance zone.